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Tonic and phasic dopamine fluctuations as reflected in beta-power predict interval timing behavior

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Abstract

It has been repeatedly shown that dopamine impacts interval timing in humans and animals (for a review, see Coull, Cheng, & Meck, 2012). Particularly, administration of dopamine agonists or antagonists speeds-up or slows down internal passage of time, respectively (Meck, 1996). This co-variations in the dopamine level and clock speed has been typically induced by pharmacological manipulations (e.g., Lustig & Meck, 2005). However, it has not been assessed whether naturally occurring fluctuations in dopamine level are sufficient for altering interval timing performance. Recent advances in neurophysiology suggest that tonic and phasic changes of dopamine level in cortical-basal ganglia loop can be traced by fluctuations of beta power (Jenkinson & Brown, 2011). We assessed dopamine levels by measuring the beta power while participants were asked to produce time intervals by two key presses. Both tonic levels of dopamine as measured by the beta power before interval initiation and phasic level of dopamine as measured after the first key-press predict timing performance. These positive correlations between beta power and length of produced intervals support the notion that dopamine plays an important role in interval timing, even in the range of naturally occurring fluctuations.

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Keywords: Dopamine; Interval Timing; Beta-Power; EEG

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